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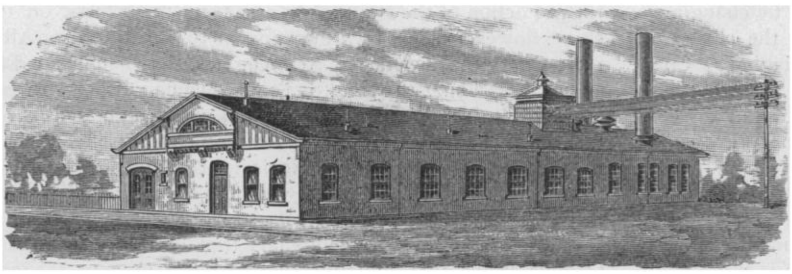
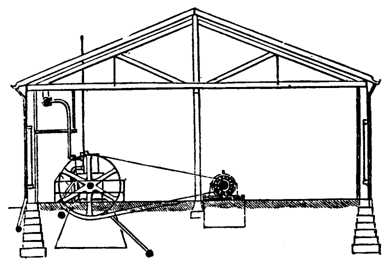
ELECTRIC LIGHTING.—A MODEL CENTRAL STATION.

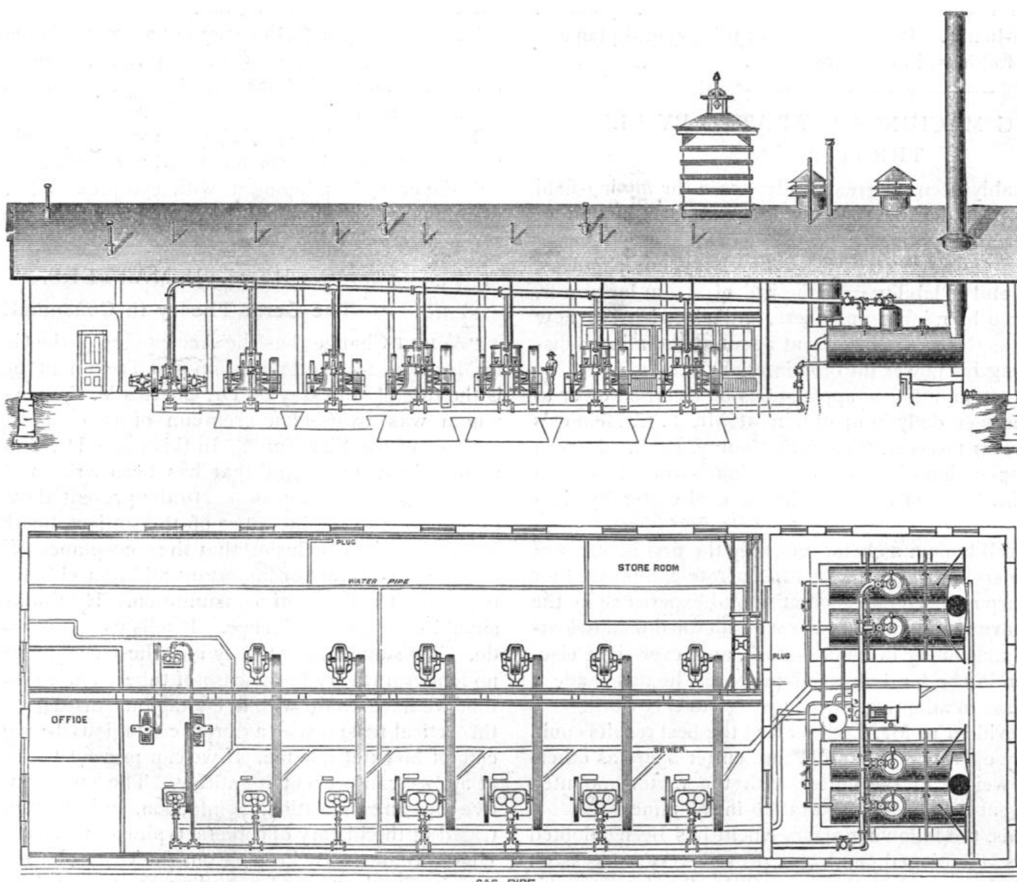
EXPERIENCE has shown that to attain the best commercial results in electric lighting, the final expression of which comes out in station, the reduced plan and elevations herewith, of a simple and efficient station, will be found of interest. The station is that of the East End Electric Light Company, at East Liberty, Penn., operating the Westinghouse alternate-current system of distribution. The service from this station covers a very extended area, comprising the business portion of the city, which lies within an average distance of half a mile from the station, ramifying through an extended series of residence streets of the better class, and carrying



WESTINGHOUSE ELECTRIC-LIGHT STATION AT EAST LIBERTY, PENN.



END-ELEVATION.



PLAN AND SIDE-ELEVATION OF WESTINGHOUSE ELECTRIC-LIGHT STATION AT EAST LIBERTY, PENN.

dividends, too much care and knowledge cannot be brought to bear upon the steam and electrical engineering involved in the construction of the plant, from the foundations of the building, to the lamp wired on the premises of the consumer. The conditions, however, are found so varied in different localities that it is manifestly impossible to establish any fixed rules. As an illustration, however, which seems to contain the essential ideas of a well-considered one special line out as far as the distant suburb of Swissvale, the last lamp being at a distance of four miles and a quarter from the dynamo.

The arrangement of the station is clearly indicated. It is a substantial but inexpensive one-story building of brick, containing the offices of the company and the storeroom for material, in addition to the dynamo and boiler room. The plant at present has an ag-

gregate capacity of about 8,000 lamps. Dynamos and engines are on the same floor, every part of which is constantly under the eye of a single attendant. Both engines and dynamos stand on brick foundations, the floor itself being of cement. Each engine is belted direct to its dynamo, no power being wasted in transmission; and the subdivision of power enables the wide fluctuations of load to be met by stopping and starting any engine and dynamo as needed, thus operating the whole station under the highest possible economical conditions at any moment. The steam-pipe is brought along the engine-room overhead, and the engines exhaust into a main laid in a covered trench underneath the floor, every part being accessible. All drips and overflows are run into a sewer. Two exciting dynamos are provided, as shown on the left of the dynamo-room, each adequate to supply current to the fields of all the alternating dynamos of the station, and each driven independently by its own engine. But one engine and exciter is therefore run at any time, the other standing ready as a relay in emergency. Moreover, the position of the engines and exciters is such that by changing a belt either engine can drive either exciter, and thus the chance of possible stoppage is reduced fourfold. The Westinghouse Company regard this latter arrangement as representing the best possible engineering, and strongly urge it upon every station of any considerable magnitude. Two overhead travelling-cranes traverse the whole length of the building over the engines and dynamos.

In a station so arranged, the labor is reduced to a minimum. With natural gas, of course, but one fireman is required; firing with coal, two firemen will be on duty in the first run of the evening, and one in the second run. But one attendant is required in the dynamo-room at any time, the lightness of his duties permitting him to give all necessary attention to the engines, dynamos, exciters, and switch-board. It is obvious that this general plan can be advantageously followed in most instances.

COAL-MINING MACHINES OPERATED BY ELECTRICITY.

THERE has probably been no greater advance in the mining-field effected during the past decade than the general introduction of electricity for power and lighting purposes.

The advantage of using electricity, its simplicity, compactness, safety, cleanliness, and reliability over the use of steam for power, were early recognized by mining engineers, and electricity is now generally regarded as the most convenient agent at the miner's disposal for transmitting his power into the interior of the mine.

One of the newest and latest applications of electric power to mining-work can be seen daily in operation at Mr. T. C. Heimes's "Drane Colliery," near Osceola, Clearfield County, Penn. Here a most interesting application of motors for mining-work has been devised by Mr. F. M. Lechner for operating a coal-cutter by electricity.

Mr. Lechner is well known as being not only the first inventor of coal-cutting machinery, but also the first to operate compressed air in mines for this purpose. His long practice and experience in the coal-mining field have made him familiar with all the difficulties attending the use of machinery in mining-work, and, ever since electric power has been in use for industrial purposes, he has made a study of the problems in adapting electric power to this work.

It soon became evident to Mr. Lechner that the best results could only be obtained by operating the motor and cutter apart, as otherwise the size and weight of the cutter with the motor mounted upon it would prevent its easy transportation in the mine.

In order to do this, the following arrangement has been adopted in the mine before mentioned, and has proved very successful. The motor, which is a 10 horse-power of the Sprague type, is mounted upon a truck running upon rails, so that it can be very easily handled and hauled from one position to another, as occasion requires. The entire weight of the motor is less than 1,000 pounds.

The cutter operated by the motor, which in this case is the "New Lechner," is set in position in the room to be cleared, and is connected with the motor by a five-eighths inch rope belt, running in V-shaped grooved sheaves, one being on the motor, and the other on the cutter.

This connection is long enough to allow the motor to be operated 30 feet away from the cutter, and the motor has been set in a position in this mine 1,600 feet away from the dynamo. The motor is held in position by guys at the point of use.

By means of screw-jacks that can be easily adjusted to any height, with loose sheaves upon them, the cutter can be operated at any angle from the motor; and the connection is made taut by moving the truck upon which the motor rests, and securing it in the right position by guys.

All mining engineers are familiar with the difficulty attending the working of the cutters in the limited space generally allotted them in mines, and know how essential it is to have every machine divested of every pound of surplus weight. They also know what care must be exercised in moving it with great iron crowbars, to prevent injury to the more delicate parts of the engines; and, however careful, how frequent it is that connecting rods and other parts are so impaired that the machine has to be sent to the shop; then how the rugged action of the engines shakes every thing loose on the machine, however firmly they may appear to be adjusted. All this is removed by the absence of the engines, the machine running as smoothly as a buzz-saw, and, as a consequence, cutting with the same facility. By this plan, three machines can be operated by one motor; for, when one room is cut, the motor can at once be hauled to another room, where a machine is in readiness and position, cut that room, and pass to a third while the coal is being removed from the first two, and the cutters being again placed in position.

It was found, upon a preliminary trial of this apparatus at the Osceola Mines, that by its use two men are able to excavate 100 tons in 10 hours, and that they can move the cutter as often as desired without any auxiliary aid.

The efficiency of both dynamo and motor is over 90 per cent; so that, allowing 10 per cent drop on the line, nearly 73 per cent of the power delivered to the dynamo-pulley can be depended upon at the motor for work.

It has been estimated that the cost of equipping a mine for the purpose of operating machinery with electricity is only about one-half the cost of equipping it with compressed air, and the price of maintenance shows about the same proportion of saving.

HEALTH MATTERS.

The Germ Theory in Consumption.

"WHAT Changes has the Acceptance of the Germ Theory made in Measures for the Prevention and Treatment of Consumption?" is the title of an essay by Dr. Charles V. Chapin of Providence, to whom was awarded a premium of two hundred dollars by the trustees of the Fisk Fund. In this essay Dr. Chapin has given an admirable *résumé* of all that has been written about consumption from the time of Hippocrates to the present day. After a careful examination of the literature of the subject, he thinks that we are justified in the conclusion that the acceptance of the germ theory has made no direct or important addition either to the hygiene or medicinal treatment of consumption. He thinks, however, that it should have great influence. It tells us plainly what we ought to do. We simply do not obey its behests. The germ theory — now no longer a theory in the case of tubercular consumption — tells us that we have to do with a contagious disease. Now, there is no theoretical reason why a purely contagious disease like tuberculosis cannot be exterminated. If we can prevent the spread of contagion at all, we can prevent it entirely. The enormous value of preventive measures, isolation, disinfection, and quarantine, is well illustrated in the history of cholera, typhus-fever, and yellow-fever in the United States. By keeping out the virus of these diseases, or destroying it when it had gained access to our shores, we have for a number of years been remarkably free from these diseases, and it is certain that if these precautions had not been taken we should have suffered severely. For obvious reasons the suppression of tuberculosis is not so easy a matter as the suppression of cholera or yellow-fever. Neither is the suppression of scarlet-fever or small-pox as easy. Yet wherever the public have been educated to a correct appreciation of the contagious nature of scarlet-fever, the number of cases has diminished very much. Even in small-pox with its virulent contagion, it is possible, by means of isolation and